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Sylvan Slough
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

James Auer
Geraghty & Miller, Inc.
35 East Wacker Drive, Suite 1000
Chicago, IL 60601

February 10, 1995

Re: Sylvan Slough Site

Dear Mr. Auer:

The United States Environmental Protection Agency ("U.S. EPA") has completed its review of the September 1994 draft Phase II Site Investigation Report, submitted on October 10, 1994 by Geraghty & Miller, Inc. ("G&M"). G&M submitted the report on behalf of Navistar International and Burlington Northern Railroad, the Respondents at the Sylvan Slough Site in Rock Island, Illinois.

The attached comments were developed in consultation with the U.S. EPA groundwater research laboratory in Ada, Oklahoma. Pursuant to the "Work to be Performed" Section of the Order, the September 1994 draft Phase II Site Investigation Report is considered approved as of the date of this correspondence, subject to the incorporation of these comments. Please submit a response to these comments, and revised pages to the draft Report which incorporate these comments, within 30 days of this correspondence. Please indicate where each comment is incorporated into the final Report.

Please contact me at (312) 886-1959 if you have any questions or need any additional information.

Sincerely,

Kenneth M. Theisen
Kenneth M. Theisen
On-Scene Coordinator

Attachment

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CC: Jeffrey Cox, ORC
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In the Matter of:
Burlington Northern Railroad and
Navistar International Transportation Corp.
Docket No. V-W-94-C-242

COMMENTS ON THE SEPTEMBER 1994 DRAFT
PHASE II SITE INVESTIGATION REPORT

I. General Comments

1. The concept proposed in Alternative 2 is satisfactory, but the number of recovery wells, spacing, and pumping rates should be refined during the final design phase, based on hydraulic parameters collected from more areas of the plume. Several areas should be addressed more fully during the final design phase:

- a) The hydraulic conductivity should be determined in or near each of the proposed recovery wells to refine the spacing of the recovery wells and the selection of pumping rates.
- b) The western edge of the free product plume is not well defined between wells MW-9 and MW-7, since the distance between these wells is about 300 feet. The edge of the plume should be better defined and it should be shown that the capture zone of the westernmost recovery well includes this edge of the plume.
- c) An additional recovery well in the center of the area with a thick layer of free product (around well GM-6) should be considered. This would allow faster recovery of free product and decrease the volume of free product transported downgradient, thus decreasing potential residual oil saturation.
- d) A downgradient well can be installed between the line of recovery wells and the Sylvan Slough to determine the effectiveness of the recovery well system and the influence of the Sylvan Slough on the recovery wells.
- e) If the pumping rate and drawdown are too high, free product will move through the formerly saturated zone, leaving adsorbed residual oil saturation that will remain as a source of contamination.

2. No discussion was provided regarding whether and what are the surface soil cleanup objectives (i.e., to what concentrations, if any, will the non-saturated soil contamination area be cleaned to), since surface soils near where the spill

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occurred are likely to be contaminated. U.S. EPA requests that these objectives and proposed cleanup alternatives be addressed.

3. U.S. EPA plans to discuss the proposed groundwater remedy with IEPA's Office of Groundwater; additional comments from IEPA may thus occur prior to Respondents' response to these comments.

4. Respondents should prepare separate tables indicating clear 'Performance Standards' to be met, and clearly identify proposed cleanup goal concentrations and/or discharge concentrations (CUGs) for:

- (a) discharge to storm sewer/surface water during pilot test;
- (b) discharge to storm sewer/surface water during operation of the pump/treat system;
- (c) cleanup objectives/concentrations to be left within the aquifer beneath the site (i.e., what is the criteria to shut down the system); and
- (d) soil cleanup objectives (i.e., to what concentrations, if any, will the non-saturated soil contamination area be cleaned).

5. Regarding the pilot test letter report, the following should be provided:

- a) information to calculate all significant aquifer properties (e.g., transmissivity, storage coefficient..);
- b) estimations of capture zones for a well placement at different rates of pumping;
- c) the specific method used to estimate capture zones;
- d) locations of where and at what rate new pumping wells will be installed to capture and prevent spread of contamination; and
- e) whether additional well(s) to ensure capture are needed.

6. The pilot test information was not specific, therefore the extraction well capture zone may not be wide enough to ensure capture of the contaminant plume, and additional well(s) may be required to ensure capture. Respondents should verify and specify either now or in the design the following information (submit this information one week before the pilot test commences):

- a) specify the expected drawdown;
- b) how the flow rate will be measured;

- c) how and which wells and/or piezometers will be monitored before (i.e., at least 24 hrs prior to the test) and during the test [i.e., provide a map with all wells to be monitored before and during the test; use pressure transducers to ensure constant measurements are taken, in particular, early in the test; whether a constant rate is expected during the entire length of the test];
- d) whether monitoring of the pump test water occur will be for all contaminants of concern at a frequency of one sample per day, with quick turnaround results;
- e) Sampling and QA/QC procedures;
- f) whether and where monitoring wells and/or piezometers will be installed near the extraction wells prior to the pilot test (per extraction well, a minimum one piezometer should be installed approximately 20' from and due north of the well, and one installed approximately 40' from and due east of the well, to determine aquifer behavior and anisotropy; screen depths should be the same screen length and depth of the extraction well);
- g) verify that the proposed screen depth will capture known vertical spread of contamination; and
- h) submit, after the pilot test is completed, a letter report with the results of the pilot test, stating how the aquifer will receive a timely and efficient restoration which maximizes pore volume flushing, and providing a simulation showing expected behavior of the system during actual cleanup.

7. Submit a comprehensive sampling and analysis plan to further characterize the nature and extent of contamination at and from the site during and after the pilot test and during the cleanup. Identify whether any additional monitoring wells are needed to identify the edge of the plume. Install several monitoring wells between the extraction wells and the Sylvan Slough, to show, after pumping is initiated, whether contamination is continuing to migrate. Piezometers may be used for sampling in lieu of monitoring wells if acceptable sampling and analysis procedures are developed and if installation procedures are provided which ensures that no analytical or sampling QA/QC problems would

result from their installation or materials.

8. Respondents are recommended to identify proposed access needs ASAP, and begin attempts to get access from any entity through the cleanup. If the PRPs are unsuccessful, U.S. EPA could then help to get access if necessary.

9. Regarding proposed schedules for all activities through cleanup which are required by the AOC, Respondents should provide a Gantt chart indicating expected overall schedule for all activities including submittal of design and construction documents. Based on the proposed project as outlined in the report, the following draft schedule is provided (assumes these comments are sent by 2/15/95):

3/15/95: submit response to these comments, including:

- a) tables of CUGs to be met
- b) letter report detailing:
 - 1) the proposed pilot test
 - 2) sampling and analysis plan (SAP)
 - 3) QA/QC requirements
 - 4) health and safety requirements (HASP)

4/5/95: receive U.S. EPA comments

5/1/95: commence pilot study fieldwork

6/1/95: begin 30-day pilot study

7/1/95: finish 30-day pilot study

7/15/95: submit pilot test letter report, with proposal for full-scale cleanup

8/5/95: receive U.S. EPA comments

9/1/95: submit letter report providing conceptual approach for full-scale project (i.e., blue-line drawings; concept calculations for flow rates; details of access needs and locations for all facilities; reiterate discharge requirements; discuss SAP, QA/QC, HASP, operational requirements;

9/20/95: receive U.S. EPA comments

10/15/95: commence full-scale fieldwork

12/15/95: finish full-scale construction

12/15/95: begin operating system

II) Specific Comments

A) Section 3.0: Phase II Soil and Groundwater Study

- 1) A more precise location of any observed points of oily discharge into the Sylvan Slough and indication of these points on the Report maps would help in visualizing the movement of the free product plume and the extent of the free product discharge into the Sylvan Slough.
- 2) P. 3-1: the two statements " Under normal conditions, Geraghty & Miller expected groundwater to flow across the BNR and Navistar properties to the north-northwest, and ultimately discharge into the Sylvan Slough." and " Due to the expected direction of groundwater flow to the north-northeast," (*italics added*) are contradictory as to the groundwater flow direction. The expected direction of groundwater flow is north-northwest.

B) 3.2.2 Free Product Thickness and Volume Estimate

- 1) The free product thicknesses observed during the September 1994 data collection should be mentioned in the text where the July 1994 thicknesses are specified. This would give a more complete view of the free product thickness, location, and variability.
- 2) The location of the former aboveground tank where the spill occurred should be indicated on the map as an aid to understanding the spread of the free product plume.
- 3) It was assumed that the average free product thickness was 0.05 ft. The basis of this assumption should be given to show it's validity. A more accurate estimation of the free product volume should be given if possible, using free product thicknesses determined in each region of the plume.

C) 3.2.3 Site Specific Hydrogeology

- 1) Slug tests were done on wells GM-1, GM-2, and GM-6, with results for k of 4.1×10^{-4} cm/sec and 2.8×10^{-2} cm/sec. Of these wells, only GM-6 is close to the line of proposed recovery wells. Slug tests in the existing wells closer to the proposed recovery wells would give more accurate and better defined hydraulic conductivity values that can then be used in the final design phase. Alternatively, hydraulic conductivity values could be determined in the recovery wells prior to starting the recovery pumping. Although these latter values could not be used in calculating the spacing of the initial recovery wells, they would be useful for placement of additional recovery wells or in modeling drawdown for various pumping rates.

2) The rationale for doing slug tests on wells GM-1, GM-2, and GM-6 was that they did not have an appreciable layer of free product. It was stated on p. 3-13 that the slug test was done on GM-6 during the Initial Site Investigation due to the lack of free product, yet on p. 3-10 and 3-11, GM-6 has 3.27 feet of free product (in July 1994). Thus, it appears that during the earlier investigation there was no free product. This possible discrepancy should be clarified as it may reveal information on the temporal behavior of the free product thicknesses and may have affected the slug test.

D) 5.2 Alternative 2: Recovery Wells/Treatment

1) The depth and screen length of the recovery wells is not specifically mentioned here, although such information was mentioned for the Alternative 1 passive recovery wells. The wells should be fully penetrating and screened to above the highest recorded water-table level. Since groundwater levels may also fluctuate due to the river stage, Respondents should propose screen lengths which account for this possibility.

E) 5.2.1 Description

1) The preliminary design is based on best-case conditions such as 100% well efficiency and use of the maximum available drawdown. The final design should take into account that these best-case conditions are not likely, and the design should be more conservative.

2) Vacuum systems will increase the rate of recovery and the capture zone of the recovery wells. The vacuum applied to the recovery well must not exceed the vapor pressure of the particular hydrocarbon being produced. Procedures need to be set up for handling the volatile organics if any are produced by the vacuum pump (Blake and Gates, 1986).

F) 5.2.2 Effectiveness

1) Pilot testing could include test wells placed in two different areas of the plume having different hydraulic conductivities, saturated thicknesses, and hydraulic gradients, instead of the single well proposed. This would better indicate differing localized responses of the aquifer to pumping. At a minimum, the result of the proposed pilot test in a single well should not be applied to the entire area without correcting for different hydrologic conditions throughout the Site.

2) The measurement of effectiveness of the recovery system is not addressed. Pilot testing is proposed for the method development, but long-term or downgradient monitoring is not discussed. A well placed downgradient of a point midway between two recovery wells would indicate the presence of free product

and could help to determine the effect of the recovery well pumping.

3) P. 5-6: it is mentioned that for the GAC unit, the influent is 40 ppm and the effluent will be 0.1 ppm (the discharge standard). It is also stated that the GAC can remove 95% of the soluble PNAs. If this reduction is on a mass basis, about 5% of the influent PNAs will be left, which is 2 ppm and thus above the discharge standard. This discrepancy should be explained.

4) P. 5-7: it is mentioned that "...the GAC process...will be able to fully remove any residual fraction of oil...". If so, the design of the usage rates of GAC has to take into account a higher loading than the 40 ppm influent mentioned above.

G) 7.0 Recommended Alternative

1) The final design phase will require the types of information listed in this section of the Report, due to the heterogeneity of the Site, the low saturated thickness, and the proximity of the Sylvan Slough. Pumping test data will be critical in evaluating the effects of long-term pumping.

H) Appendix F

1) The aquifer is not homogeneous, so hydraulic conductivity and saturated thickness will vary along the transect of the proposed recovery wells. The initial design of well spacing used an assumed representative value for hydraulic conductivity (10^{-3} cm/sec) with three different saturated thicknesses. The final design phase well spacing and pumping rates should use hydraulic conductivity, hydraulic gradient, and saturated thickness values to be determined for the vicinity of each recovery well. The optimum spacing between wells may not be equal between all pairs of wells, and optimum pumping rates may vary from well to well. Slug tests should be performed on existing wells in this region or in each new well that is part of the recovery system to determine hydraulic conductivity for use in the design or operational phases.

2) The capture zone width calculations in the Appendix F Engineering Analysis used a hydraulic gradient of 0.005; they should have used the more accurate hydraulic gradient of 0.0058 that was calculated using the data in Section 3 of this Appendix. The capture zone decreases with a higher hydraulic gradient; thus more wells would have been indicated.

3) The drawdown could be a significant fraction of the initial saturated thickness, and could significantly decrease the transmissivity. Also, as the saturated thickness decreases, the rate of drawdown will increase. The drawdown calculations were

based on the confined aquifer equation: these are valid if the drawdown is small in comparison to the initial saturated thickness (Freeze and Cherry, 1979, p. 325). If not, Neuman's solution with the unconfined well function can be used (Freeze and Cherry, p. 326).

4) The drawdown analysis neglected the effect of the river recharge boundary and the effect of multiple pumping wells. The river recharge boundary will decrease the rate of drawdown. For the final design, these effects on drawdown should be addressed.

5) Capture zone maximum width, well spacing, and stagnation point location can be calculated using the methods outlined in Keely and Tsang (1983) and in Javandel and Tsang (1986), for relatively small drawdowns. The methods were developed for confined aquifers, but are valid at small drawdowns for unconfined aquifers. A comparison of the capture zones and well spacings of Appendix F with those calculated by these methods indicated that the preliminary number of proposed recovery wells is sufficient, for the one hydraulic conductivity value chosen (10^{-3} cm/sec). These methods should be used to verify the well spacing and capture zone widths calculated during the final design phase, if drawdown is sufficiently small.

The following references were used to help generate these comments:

a) Blake, S.B., and M.M. Gates. 1986. Vacuum enhanced hydrocarbon recovery: A case study. In Proceedings of Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection and Restoration, November, 1986, Houston, Texas, pp. 709-721.

b) Freeze, R.A. and J.A. Cherry. 1979. Groundwater. Prentice-Hall, Inc., Englewood Cliffs, NJ.

c) Javandel, I. and C.F. Tsang. 1986. Capture-zone type curves: A tool for aquifer cleanup. Ground Water. 24:616-625.

d) Keely, J.F. and C.F. Tsang. 1983. Velocity plots and capture zones of pumping centers for ground-water investigations. Ground Water. 21:701-714.